

WHAT IS CLAIMED IS:

1. A method of decoding an input semantic structure to generate an output semantic structure, the method comprising:

providing a set of transfer mappings;
calculating a score for at least one transfer mapping in the set of transfer mappings using a statistical model;
selecting at least one transfer mapping based on the score; and
using the selected transfer mapping to construct the output semantic structure.

2. The method of claim 1, wherein providing a set of transfer mappings comprises providing a set of transfer mappings, each transfer mapping having an input semantic side that describes nodes of the input semantic structure and having an output semantic side that describes nodes of the output semantic structure.

3. The method of claim 1, wherein calculating a score for at least one transfer mapping comprises calculating a score using a target language model that provides a probability of a set of nodes appearing in the output semantic structure.

4. The method of claim 2, wherein calculating a score for at least one transfer mapping comprises calculating a score using a channel model that

provides a probability of an input semantic side of a transfer mapping given the output semantic side of the transfer mapping.

5. The method of claim 4, wherein calculating a score using the channel model comprises normalizing a channel model score based on a number of overlapping nodes between transfer mappings.

6. The method of claim 2, wherein calculating a score for at least one transfer mapping comprises calculating a score using a fertility model that provides a probability of node deletion in a transfer mapping.

7. The method of claim 2, wherein calculating a score for at least one transfer mapping comprises calculating a size score based on a number of nodes in the input semantic side of the transfer mapping.

8. The method of claim 2, wherein calculating a score for at least one transfer mapping comprises calculating a rank score based on a number of matching binary features in the input semantic structure and the input semantic side of the transfer mapping.

9. The method of claim 2, wherein calculating a score for at least one transfer mapping in the set of transfer mappings comprises:

computing separate scores for a plurality of models; and
combining the separate scores to determine the score for the transfer mapping.

10. The method of claim 9 wherein the plurality of models comprises a channel model that provides a probability of an input semantic side of a transfer mapping given the output semantic side of the transfer mapping.

11. The method of claim 9 wherein the plurality of models comprises a fertility model that provides a probability of node deletion in a transfer mapping.

12. The method of claim 9 wherein the plurality of models comprises a target language model that provides a probability of a set of nodes appearing in the output semantic structure.

13. The method of claim 9 and further comprising:
computing a size score for the transfer mapping,
the size score based on a number of nodes
in the input semantic side of the transfer
mapping; and
combining the size score with the separate
scores for the plurality of models to
determine the score for the transfer
mapping.

14. The method of claim 9 and further comprising:
 computing a rank score for the transfer mapping,
 the rank score based on a number of
 matching binary features in the input
 semantic structure and the input semantic
 side of the transfer mapping; and
 combining the rank score with the separate
 scores for the plurality of models to
 determine the score for the transfer
 mapping.
15. The method of claim 9 wherein combining the
scores comprises:
 multiplying each score by a weight to form
 weighted model scores; and
 summing the weighted model scores to determine
 the score for each transfer mapping.
16. The method of claim 2, wherein providing a set
of transfer mappings comprises providing a set of
transfer mappings arranged as a tree structure
comprising a root transfer mapping and subtrees, each
subtree comprising a root transfer mapping, wherein
each transfer mapping in the set of transfer mappings
appears as a root transfer mapping in at least one of
the tree and subtrees.
17. The method of claim 16 wherein providing a set
of transfer mappings as a tree structure comprises
providing multiple levels of nested subtrees.

18. The method of claim 17 wherein calculating a score for at least one transfer mapping comprises calculating a score for a tree of transfer mappings through steps comprises:

recursively calculating a score for each level of nested subtrees, wherein calculating a score for a subtree comprises recursively scoring the subtrees of the subtree, calculating a score for the root transfer mapping of the subtree, and combining the scores for the subtrees of the subtree with the score for the root transfer mapping of the subtree;

calculating a score for the root transfer mapping; and

combining the score for each subtree with the score for the root transfer mapping.

19. The method of claim 18 wherein computing a score for a root transfer mapping comprises computing a size score for the root transfer mapping based on a number of nodes in the input semantic side of the root transfer mapping.

20. The method of claim 18, wherein combining the score of subtrees with the score for a root transfer mapping comprises combining size scores for the subtrees with the size score for the root transfer

mapping by averaging the size scores for the subtrees with the size score for the root transfer mapping.

21. The method of claim 18 wherein computing a score for a root transfer mapping comprises computing a rank score for the root transfer mapping based on a number of matching binary features in the input semantic structure and the input semantic side of the root transfer mapping.

22. The method of claim 21, wherein combining the score of subtrees with the score for a root transfer mapping comprises combining rank scores for the subtrees with the rank score of the root transfer mapping by averaging the rank scores for the subtrees with the rank score of the root transfer mapping.

23. A machine translation system for translating an input in a first language into an output in a second language, the system comprising:

- a parser for parsing the input into an input semantic representation;
- a search component configured to find a set of transfer mappings, wherein each transfer mapping corresponds with a portion of the input semantic representation;
- a decoding component configured to score a plurality of transfer mappings and to select at least one transfer mapping based on the scores; and

a generation component configured to generate the output based on the selected transfer mapping.

24. The machine translation system of claim 23, wherein the decoding component scores each transfer mapping by using a plurality of statistical models.

25. The machine translation system of claim 24, wherein the output comprises an output semantic representation and wherein the plurality of statistical models comprises a target model that provides a probability of a sequence of nodes appearing in the output semantic representation.

26. The machine translation system of claim 24, wherein the plurality of statistical models comprises a channel model that provides a probability of a set of semantic nodes in an input side of a transfer mapping given a set of semantic nodes in an output side of the transfer.

27. The machine translation system of claim 24, wherein the plurality of statistical models comprises a fertility model that provides a probability of a node deletion in the transfer mapping.

28. The machine translation system of claim 24, wherein the decoding component scores each transfer

mapping using a size score based on a number of nodes in an input side of the transfer mapping.

29. The machine translation system of claim 24, wherein the decoding component scores each transfer mapping using a rank score based on a number of matching binary features between the input and an input side of the transfer mapping.

30. A computer-implemented method of determining a score for a word string, the method comprising:

 computing a semantic structure having a plurality of nodes that relate to the word string; and

 scoring the word string with a target language model that provides a probability of sequences of nodes in the semantic structure to score the word string.

31. The computer-implemented method of claim 30, wherein providing a semantic structure having a plurality of nodes comprises providing a semantic structure having a plurality of word nodes and at least one relationship node that describes a semantic relationship between words.

32. The computer-implemented method of claim 30, wherein providing word nodes comprises providing word nodes for lemmas.

33. The computer-implemented method of claim 30, wherein scoring the word string with a target language model comprises scoring the word string with the target language model in machine translation.

34. The computer-implemented method of claim 30, wherein scoring the word string with a target language model comprises scoring the word string with the target language model in speech recognition.

35. The computer-implemented method of claim 30, wherein scoring the word string with a target language model comprises scoring the word string with the target language model in optical character recognition.

36. The computer-implemented method of claim 30, wherein scoring the word string with a target language model comprises scoring the word string with the target language model in grammar checking.

37. The computer-implemented method of claim 30, wherein scoring the word string with a target language model comprises scoring the word string with the target language model in handwriting recognition.

38. The computer-implemented method of claim 30, wherein scoring the word string with a target language model comprises scoring the word string with the target language model in information extraction.